



Patenting innovation in oil and gas: Executive Summary

Background

The oil and gas (O&G) business has been a rich source of innovation throughout its history, developing and deploying cutting edge technologies to discover, develop and, deliver ever-increasing quantities of oil and gas from ever-more complex and remote locations beneath the earth's surface. While we can readily see the emergence of new technology and operating practices, it has always been challenging to characterize holistically the direction and pace of innovation in the industry, both in and of itself, and relative to other industries of economic and human activity.

One way to understand this change is through a deep and comprehensive analysis of data relating to US patent

filings and citations over time to identify patterns and the linkages associated with key categories of technology in the patents database. Deloitte applied this approach in the 2015 research paper "Tracking innovation in oil and gas patents: The role and influence of the US Department of Energy." In this study we used deep analytics to illustrate the role of US government-funded innovation in the oil and gas industry, and how this had been adopted by commercial operators in the industry.

In this subsequent paper, we broaden our scope to include all sources of innovation (patent filings and citations) in the areas of technology we have identified as most relevant for oil and gas. We also take a look at the innovation trends they reveal

for the patents filed between 2006 and 2015 (the most recent year for which we have complete patent data) with the US Patents and Trademark Office (USPTO). Both the methodology and the results should be of interest to (a) the research and development arms of oil and gas companies, and (b) oilfield service companies as well as technology ventures looking to either find oil and gas applications for their innovations or, conversely, adapt oil and gas related technologies to other industries. We also introduce the Deloitte "Energy Innovation Index" that measures how much the oil and gas industry is borrowing innovation from distant technologies versus deepening innovation within traditional oil and gas technologies. ➔

Summary

There are at least two separate paths to technological innovation—improvements within a given technological area (for example, faster microchips) or the consolidation of disparate technologies (for example, measurement while drilling technology that uses multiple telemetry systems). Both can yield substantial improvements in the growth potential and profitability of firms as well as deliver value to customers.

But which path best characterizes the oil and gas industry? To answer this, Deloitte used comprehensive patent data and a new proprietary method to measure the arc of innovation in the oil and gas space.

Major findings

- 1 While the growth trajectory of O&G patent filings has moderated over the past few years, innovation in core technologies like earth drilling, geophysics, and metalworking continue to outpace the growth in the entire patent universe.
- 2 Ancillary technologies like metalworking are assuming a bigger role in innovation by providing a bridge between core technology areas like earth drilling and other smaller and distinct technologies in O&G. These new bridges are changing the shape of oil and gas innovation.
- 3 Deloitte's proprietary oil and gas "Innovation Index" shows innovation has become more focused on application within its core industry and somewhat less linked to technologies from other industries over time, indicating more attractive opportunities within oil and gas.
- 4 Hydraulic fracturing, where patent filing has more than doubled over the past 10 years, is a telling example of innovation within the O&G core industry. Earth drilling, the most cited subgroup since the 1860s for patent filers, is the prime source of innovation for recent hydraulic fracturing-related patents.
- 5 New and ongoing research in the field of nanoparticles, monitoring and sensing, fluids treatment, and management suggest that fracking-related innovation is continuously looking outward and feeding back into accelerated innovation through the patenting process. This likely bodes well for the future potential of the oil and gas industry to continue to innovate its way to growth despite a naturally depleting resource.

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